USFS R1
AIR RESOURCE MANAGEMENT
APRIL 1997

PURPOSE

This document describes the legislative requirements and stewardship philosophy for managing air as a resource in the Northern Region. It outlines a program for the Region to meet air regulatory responsibilities, to better protect Forest resources from air pollution, and to move the Region toward integrating air quality considerations, both on and off the National Forest, into land management planning.

LEGISLATIVE REQUIREMENTS

Four statutes directly refer to air resource management of National Forests: 1) the Clean Air Act Amendments of 1977 and 1990 (42 U.S.C. 7401 - 7626); 2) the Forest and Rangeland Renewable Resource Act of 1974 (16 U.S.C. 1601), as amended by the National Forest Management Act (16 U.S.C. 1602); 3) the Federal Land Management Policy Act of 1976 (43 U.S.C. 1701). The Wilderness Act (16 U.S.C. 1131 et. seq.) refers to air resource management indirectly.

THE CLEAN AIR ACT

The 1977 Clean Air Act amendments, strengthened by the 1990 amendments, gave Federal Land Managers (FLM's) an "affirmative responsibility" to protect the Air Quality Related Values (AQRVs) of Class I areas from adverse air pollution impacts. Although Regional Foresters have been delegated this responsibility within the Forest Service, each level of the organization has an important role to play (appendix 1). AQRVs, as defined by Congress, include "the fundamental purposes for which [Class I areas] have been established and preserved by the Congress and the responsible federal agency" (Senate Report 95-127, p. 36). AQRVs are also those features or properties of a Class I area which can be changed by air pollution. Mandatory Class I areas were designated under the Clean Air Act and are usually pristine areas of the country which receive the highest degree of regulatory protection from air pollution impacts. Appendix 2 defines the Classes designated under the Clean Air Act and lists the areas in Region 1.

Prevention of Significant Deterioration

The regulatory protection of AQRVs in Class I areas is embedded in the Prevention of Significant Deterioration (PSD) section of the 1977 amendments. This section describes a permitting program to preserve the "clean" air usually found in pristine areas while allowing controlled economic growth around these areas. The Prevention of Significant Deterioration permitting program applies to new, major sources of air pollution or modifications to existing sources which have the potential to emit certain amounts of air pollution regulated by the Environmental Protection Agency. The Prevention of Significant Deterioration program is administered by the State air

regulatory agencies with oversight authority retained by EPA. It is a very complex process and requires detailed descriptions of the proposed operation and its pollution control technology, anticipated emissions, and a comparison with air quality standards and pollution increment increases. In the Prevention of Significant Deterioration review process, the Forest Service has delegated to the Regional Forester the authority to determine the effects of emissions on AQRVs and recommend to regulatory agencies whether or not a permit should be issued or modified. If an adverse impact determination is to be made, the Washington Office should be consulted.

Specific sensitive receptors and Desired Future Conditions must be identified for each AQRV in order to respond to the regulatory needs of the Prevention of Significant Deterioration process. Sensitive receptors are specific components of an AQRV which can first exhibit man-caused change from air pollution. For instance, a specific wilderness lake may serve as a sensitive receptor for wilderness aquatic ecosystems. The Desired Future Condition is the desired long-term health of the AQRV over the next 10, 15, or 20 years.

New Source Review

The Environmental Protection Agency has established ambient air quality standards for six pollutants know to harm human health: ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen oxides (Appendix 3). If these standards are exceeded, in other words not attained in an area or community, that place then becomes a "non-attainment" area. Appendix 4 lists the non-attainment areas in Region 1. If a major new air pollution source is to be located in a non-attainment area, that source is subject to the New Source Review process instead of the Prevention of Significant Deterioration process. The New Source Review process is designed to allow a net air quality improvement in the area even after the proposed source begins operation. The proposed source must undergo an analysis of alternative sites, sizes, production processes, and control techniques. It must also determine that the benefits of the source outweigh its environmental and social costs. Although the Forest Service may be involved in pre-application meetings and other consultations, the formal involvement is through the public comment period. It is important that the Forest Service take the opportunity to comment on the effects of the new source on National Forest lands including Class I and Class II areas.

Conformity

Section 176(C) of the 1990 amendments states that activities of all federal agencies must conform to the intent of the appropriate State Implementation Plan. Further, agencies cannot:

- cause or contribute to any violations of ambient air quality standards,
- increase the frequency or severity of any existing violations,
- or, impede a State's progress in meeting their air quality goals.

The intent of conformity applies to all federal activities or federally sponsored activities regardless if they are located in an attainment or non-attainment area. However, EPA's current rules (1994) are specific to non-attainment areas and, although open to interpretation, apply only to non-attainment areas. EPA may issue additional rules in the future for attainment areas.

FOREST AND RANGELAND RENEWABLE RESOURCES ACT AND FEDERAL LAND MANAGEMENT POLICY ACT

These Acts and subsequent rules provide a mandate to:

- Protect and improve the quality of the air resource on National Forests,
- Manage public lands in a manner which protects air quality and atmospheric values,
- Requires the Federal Land Manager (FLM) to comply with requirements imposed by federal, state, interstate or local administrative authorities or courts, and
- Requires consultation with states on matters of air quality.

WILDERNESS ACT

The Wilderness Act (and subsequent Acts designating individual Wilderness Areas) was enacted to preserve wilderness resources and character. Although air quality and its effects are not directly mentioned in the Wilderness Act, the Act requires the Forest Service to minimize the effects of human use or influence on natural ecological processes and preserve "untrammeled" natural conditions within wilderness. Consequently, this includes minimizing the effects of human caused air pollution to the wilderness and its air quality related values.

STEWARDSHIP RESPONSIBILITIES

NATIONAL POLICY AND DIRECTION

Chief's Course to the Future

The Forest Service is committed to sustaining ecosystems by ensuring their health, diversity, and productivity. The Agency is also committed to working collaboratively and using appropriate scientific information in caring for the land and serving people (Chief's Course to the Future, 1994). The management of air quality is integral to meeting these goals because of its effects to resources and people.

National Strategy for Air Resource Management

The mission for the Forest Service in air resource management is to protect NFS lands from air pollution impacts, to manage NFS emissions in accordance with national and local ambient air quality standards, and to protect visibility in Class I areas. This plan envisions a leading role for the Forest Service in recognizing that air is a resource that can and should be protected to meet the changing needs of the public (National Strategic Plan for Air Resource Management, 1994).

Forest Service Manual Direction (FSM 2580)

The Forest Service policy is to integrate air resource management objectives into all Forest Service resource planning and management activities and to use cost effective methods to achieve these objectives. These objectives are:

1. To protect AQRVs within Class I areas from adverse impacts caused by air pollution.
2. To control and minimize air pollutant impacts from land management activities.
3. To cooperate with air regulatory authorities to prevent significant adverse effects of air pollutants and atmospheric deposition on forest and rangeland resources.

REGIONAL POLICY AND DIRECTION

Conversation Leadership Framework

The Region 1 philosophy seeks to enhance community relationships through sustaining production of resources while conserving ecosystems. This is to be done by 1) performing annual work in a timely cost-effective manner which provides goods and services while sustaining healthy ecosystems, 2) adjusting long-term direction in response to new information and technology, 3) and aligning behavior to be more adaptive and responsive in order to meet 1 and 2 above.

Living with Fire

Region 1 has a strategy aimed at restoring the health and sustainability of short-interval fire dependent ecosystems. This strategy crosses all program areas because of its direct link to forest health. Air resource management will be a critical part of this program because of the obvious impacts of smoke. It will be important to look beyond the obvious however to evaluate how emissions, whether generated by fire or humans off-site, impact these restored systems and vice-versa.

Regional Air Resource Management Direction

In air quality terms, the Conservation Leadership Framework and the Living with Fire strategies, mean 1) performing the annual work of inventory, monitoring, and modeling, 2) integrating and applying the data and information to decision making in the Prevention of Significant Deterioration and New Source Review processes and the National Forest Management Act (NFMA) and National Environmental Policy Act (NEPA) processes, and 3) evaluating the results of management and monitoring decision to better align the air program to meet desired goals.

OVERVIEW OF NORTHERN REGION PROGRAM

MEETING LEGISLATIVE REQUIREMENTS

"Prevention of Significant Deterioration" Permit Review and Response

In Region 1, the Montana Department of Environmental Quality, the Idaho Division of Environmental Quality, and the North Dakota Department of Health / Environmental Engineering Division are responsible to implement and enforce the requirements of the Clean Air Act. In some cases, such as Missoula or Flathead counties, MT, the responsibility has been delegated to a local regulatory agency but oversight for the program rests with the state government and ultimately rests with the Environmental Protection Agency.

As mentioned earlier, when a major new source of air pollution (such as a power plant) or modification of an existing source wants to locate in an attainment or unclassified area and will emit a certain kind and amount of air pollution, a Prevention of Significant Deterioration permit application must be submitted to the appropriate air regulatory authority (see glossary for definition of major source). Although Montana, Idaho, and North Dakota have similar time scales for reviewing and responding to Prevention of Significant Deterioration permit applications, some things are different. All three States must notify the Region within 30 days of a pre-application notice. Once an application has been received, the state has 30 days to inform the owner or operator of the source whether or not their application is complete. The Regional Forester should submit comments to the state regarding the completeness of the application within this 30-day period.

Once an application is complete, the States have a specified amount of time to recommend whether the permit should be issued, denied, or modified before it is issued. This timeframe includes time for public comment. In Montana, it is the same timeframe as that of the Montana public hearing process (Administrative Rules of MT 16.8.960-961). In Idaho, the timeframe is 60 days (Idaho Air Pollution Authority 16.01.01-012,13). In North Dakota, it may be as long as a year (ND Air Pollution Control Law 33-15-15-01).

During this time, the Regional Forester, in consultation with the Forest, should recommend the permit be issued as is or modified. If the impacts to AQRVs are not adverse, the notification should state the Forest Service has no specific air quality objections. If the impacts are unknown, the recommendation should be to request more information from the applicant. If the impacts are clearly adverse, the Regional Forester should recommend emission reduction alternatives or consult with the Washington Office to make an adverse impact determination. A VALID recommendation is based on much information, including the baseline air quality for the area, the increments which have already been consumed, computer modeling of the source's emissions, and impacts of the projected emissions on AQRVs.

Over the last seven years, the Region has commented on Prevention of Significant Deterioration permits proposed for modified facilities near Columbia Falls, Helena, Trident, Townsend, Livingston and other places. The Forest Service Handbook FSH 2509.19 (draft) contains a listing of appropriate procedures helpful to the Prevention

of Significant Deterioration process. The Region's "screening document" (see below) also provides guidance for this process.

> *A Screening Procedure to Evaluate Air Pollution Effects in Region 1 Wilderness Areas* (Stanford, J.A., et al., in press)

This document was developed by scientists and managers who gathered to evaluate air pollution effects on aquatic, terrestrial, and visibility resources in Region 1 wilderness areas. Workshop participants identified parameters, such as lake chemistry, or visual range that would predictably react to changes in air quality. They also developed thresholds or criteria to help managers assess the potential effects of air pollution to resources. The resulting document can be used by managers to "screen" the sources whose emissions will not likely have an effect versus those that will. This allows the manager to focus his/her time, energy, and resources more effectively in protecting areas most at risk.

New Source Review

The requirement for New Source Review for the States of Montana, Idaho, and North Dakota are found in the following rules:

- Permit Requirements for Major Stationary Sources or Modifications Located Within Non-attainment Areas (MT ARM 16.8.1701)
- Permit Requirements for New Major Facilities or Major Modification in Nonattainment Areas (IDAPA 16.01.01012,06)
- Designated Air Contaminant Sources, Permit to Construct, Permit to Operate (ND Air Pollution Control Rules 33-15-24).

Conformity

In Region 1, non-attainment boundaries are usually based on city boundaries. Virtually all land management activities in Region 1 occur outside these non-attainment areas (Appendix 4), therefore the issue of conformity is technically moot. (For example, prescribed burning occurring on Blue Mountain would be outside the Missoula non-attainment area and hence would be exempt from the conformity requirements). For those activities occurring within non-attainment areas such as leasing federal land, granting a special use permit, construction of federal buildings, or prescribed burning, a conformity determination is required. EPA has developed a flow chart to determine applicability which is based mainly on the amount of emissions to be produced from the project and the existing background air quality. If conformity applies, certain criteria, procedures (including public participation), and mitigation must be followed. To arbitrarily omit any part of the process exposes the Region to legal action. To be as consistent and correct as possible, it is important to contact the Regional Office Air staff if a project is to be located in a non-attainment area.

Current Region 1 Sources of Air Pollution

Current stationary sources in Montana producing more than 100 tons per year of pollutants are shown in Appendix 5. Stationary sources in Northern Idaho producing more than 90 tons per year are shown in Appendix 6.

Montana - The Montana Department of Environmental Quality has published annual monitoring summaries since the early 1970's. The most persistent problems have been consistent violations of PM-10 ambient air quality standards in Libby, Missoula, Butte, Columbia Falls, Kalispell, Polson, Ronan, and Thompson Falls. Sources include a combination of smoke from residential wood burning, forest practices, road dust, motor vehicles, and several other minor sources. Carbon monoxide violations have been measured in Missoula, Great Falls, and Billings. Many of these areas have been designated as non-attainment areas by the Montana Department of Environmental Quality. Several of the municipalities and industrial sources are working with the Department to develop plans to bring the areas into compliance.

Total stationary sources of emissions in Montana have been reduced significantly during the last 15 years. The old Anaconda smelter, which emitted over 300,000 tons of sulfur dioxide (SO_2) per year, shut down in 1980 thereby reducing the statewide total of SO_2 emissions by 80%. The largest stationary sources of air pollution in Montana include the Coalstrip power plant units in Rosebud County (about 13,000 tons/year of SO_2 and 17,000 tons/year of nitrogen oxides (NOx)), Yellowstone County (Billings/Laurel) oil refineries and coal burning power plants (23,000 tons/year of SO_2, 6,000 tons/year of NOx), and a lead smelter in East Helena (about 23,000 tons/year of SO_2). All of the these sources occur in areas of predominantly westerly wind flow and good pollution dispersion. Lead ambient air quality standards have been consistently violated in the area around the smelter in East Helena since monitoring was started in the early 1970's. Some violations of sulfation rates and SO_2 have been measured in Billings. Particulate and SO_2 ambient standards around Coalstrip have not been violated.

Most of the Montana point sources are downwind or at considerable distance from National Forest Wilderness areas. The largest potential for Wilderness area impact in Montana from stationary sources appears to be in the Gates of the Mountains from the East Helena lead smelter and the northeast part of the Absaroka Beartooth Wilderness from the Yellowstone County SO_2 sources.

The most notable form of observed air pollution in the Montana Region 1 Wilderness areas is smoke from wildland fires and broadcast burning (forest and grass fields) in Montana, Idaho, and several other western states.

Idaho - Large point source emissions in northern Idaho total only 26% compared to the emissions from large point sources in Montana. Major point sources are located in almost every northern Idaho county. The largest point sources of emissions are

from the Three River Timber Company in Idaho county, the Potlatch complex at Lewiston in Nez Perce county, the Potlatch complexes at St. Maries and Edwards Lumber Mill in Benewah county, and the Potlatch Jaype Plywood facility in Clearwater county. Carbon monoxide and particulates are the pollutants emitted in greatest quantities from these facilities. In Kootenai county, the Athol compressor in Kootenai county produces large quantities of carbon monoxide and nitrogen oxides.

The State has also identified non-point sources or area sources as major contributors to air problems. Area sources include residential wood burning stoves, automobiles, large and small industry, agricultural activities, unpaved roads, grass field burning and forest fires. In northern Idaho, the communities with particulate matter concerns are Sandpoint (Bonner County), Pinehurst and the Silver Valley (Shoshone County).

MEETING STEWARDSHIP RESPONSIBILITIES

To most effectively meet stewardship responsibilities, the Region needs to be diligent in addressing air quality concerns at all levels of planning. This planning may be at the multi-state or Regional level such as with the Columbia River Basin assessment, at the Forest level as Forest Plans are revised, or at a project level when NEPA analysis is required. We are guided not only by the Clean Air Act Amendments but by the National Forest Management Act and the Federal Land Management Policy Act.

Planning - Geographic Levels

Regional / Multi-state Level

This level of planning needs to consider emissions sources and effects across a broad geographic scale. Work done for the Columbia River Basin Assessment (Appendix 7) displays the major emission sources within or impacting the Basin, and their proximity to Class I and non-attainment areas. Ecosystems and resources at risk from air pollution may be Ponderosa pine, fir, and spruce species because of increases in nitrogen deposition due to expanding human population and fertilizing of agricultural land. Also, certain high elevation lakes and streams may be at risk because of their inability to buffer any future inputs of acid deposition (Schoettle, et al., in press). The air quality information from the Columbia River Basin assessment should be considered and incorporated into future Forest planning as much as possible.

Forest Plan Level

A much more complete addressing of air quality issues is anticipated in the next round of Region 1 Forest Plan revisions. The major air quality emphasis areas include defining air quality issues; establishing objectives and standards; describing the affected environment, proposed environmental consequences and proposed monitoring.

Defining Air Quality Issues

Several air quality issues should be evaluated as part of the NEPA process for Forest plan revisions including:

1. What are the current air quality conditions within the Forest and are state and national air quality standards being met? If non-compliance areas occur on the Forest, what are the sources?

2. Will the management activities proposed by the Forest plan meet air quality standards and visibility requirements?

3. How will the Forest, through participation in the air regulatory process, insure that permitted activities and potential emission increases from outside the Forest meet air quality standards and protect AQRV's in Class I areas?

Objectives and Standards

Subsequent forest plan implementation and NEPA efforts will use the Forest Plan objectives and standards for air quality direction. These are:

1. Forest management and permitted activities will comply with National and State ambient air quality standards, regional haze visibility requirements, Class I and Class II Prevention of Significant Deterioration increments, conformity analysis requirements, and other state and national air quality standards and coordination requirements (such as the Montana Smoke Management Memorandum of Agreement, 1988).

2) Activities which pose potential to substantially change air quality conditions (such as broadcast burning, oil and gas leasing, and ski area development) should include an air quality issue in NEPA analysis and include effects disclosure and comparison to air quality standards using accepted analysis methods.

3) AQRV's will be identified in Class I areas and AQRV inventory and monitoring plans integrated into Wilderness Implementation plans. Monitoring of AQRV's will be conducted to determine condition, trend, and sensitivity for AQRV's particularly subject to air pollution.

4) AQRV's will be protected through coordination with the State regulatory agencies in the Prevention of Significant Deterioration permitting process, and other permitting activities. This requirement applies primarily to upwind industrial developments with the potential to adversely impact Class 1 AQRV's.

5) To prevent significant adverse effects of air pollutants and atmospheric deposition on forest and rangeland resources by cooperating with air regulatory authorities.

Affected Environment

Existing air quality condition information in and around a Forest can be summarized or referenced. Much of this information is summarized in this Region 1 Air Resource Management Program document.

Environmental Consequences

Specific air quality environmental consequences will be disclosed in NEPA project documents such as for broadcast burns, timber sales, mining, and oil and gas development. However a general discussion of air quality effects of Forest Plan alternatives should be included in the environmental consequences section. This could include a summary of the number of acres by decade of broadcast burns, amount of timber sale activity and associated slash burning, and other emissions. A general disclosure of emissions and consequences could be discussed. The main thrust would be to evaluate if typical projects (broadcast burns, timber sale activities, mining, oil and gas emissions) pose a potential to violate ambient air quality standards.

Monitoring

The monitoring sections of the Forest plan should include the proposed air quality monitoring activities. Much of the air quality monitoring will be associated with Class I Wilderness AQRV plan implementation such as visibility, lake chemistry, snow chemistry, and lichen monitoring. AQRV monitoring plans should be incorporated into Wilderness Implementation Plans.

Project Level Air Quality NEPA Analysis

Project level NEPA documents should include air quality issues and concerns when they are likely to be significant, such as:

* The project is highly controversial with intense public scrutiny or air quality was raised as an issue in scoping .

* The project's emissions has the potential to impact a Class I area or other environmentally sensitive areas.

* The project could add emissions to a designated non-attainment area.

* Public health or safety could be affected by emissions.

A Desk Reference for NEPA Air Quality Analysis (Ch2MHill, 1995), developed for the Forest Service, contains specific air quality NEPA guidance and procedures for evaluating emissions from Forest Service activities. The desk reference summarizes models which can be used in NEPA analysis as well as aerometric monitoring. The Air Quality Analysis for Oil and Gas Leasing, USFS R1, 1994 contains a description of methodology appropriate for NEPA analysis of oil and gas drilling and production.

When an air quality issue is included in a NEPA document the disclosure should include:

Affected Environment

- Describe air quality background conditions
- Describe wind dispersion patterns in the area, including inversion potential
- Describe downwind sensitive areas (environmental and municipal), Pollution Exposure Index may be helpful.
- Summarize regulatory emission requirements

Environmental Consequences

- Estimate emission levels by alternative
- Analyze air quality impacts under various atmospheric conditions. Potential computer models to be used include FOFEM, SASEM, SCREEN2, COMPLEX1, and NFSPUFF.
- Compare computer model results to ambient air quality standards
- When Class I areas are involved, an analysis of potential effects on AQRV's is appropriate. This can include dispersion modeling and comparison to Prevention of Significant Deterioration increments, VISCREEN modeling for visibility, and MAGIC/WAND modeling for lake chemical changes.

There are several documents which can guide a District or Forest in adequately addressing air quality concerns. These include:

CH2MHill. 1995. A Desk Reference for NEPA Air Quality Analyses. Prepared for USDA Forest Service.

CH2MHill. 1994. An Introduction to Air Quality Modeling. Prepared for USDA Forest Service.

CH2MHill. 1996. An Introduction to Smoke Emissions and Dispersion Modeling. A Short Course prepared for the Northern Region.

Region 1. 1994. Air Quality Guidance for Oil & Gas Leasing.

Region 1. 1993. Describing Air Resource Impacts from Prescribed Burning Activities in NEPA Documents.

Forests and Districts are expected to have the expertise to operate the smoke management models such as FOFEM, SASEM, or NFSPUFF. For other air quality dispersion or visibility models, the Regional Office air staff is available to help.

Pollution Exposure Index

Mark Schaaf, of CH2M HILL, worked with Bill Jackson, of the Forest Service Region 8, to improve Emission Distance Criterion by adding terrain elevations and atmospheric mixing heights. Emission Distance Criterion evolved to be called Pollution Exposure Index. The Pollution Exposure Index model is a computer GIS

application used to estimate the exposure of National Forests to airborne pollutants. New Source Review and Prevention of Significant Deterioration permit processing, Forest Plan revision and NEPA project analysis can be assisted by mapping relative areas of sensitivity to airborne pollutants using the Pollution Exposure Index model.

Pollutant exposure rates are calculated for user-specified receptor sites based on pollutant emission rates from regional point and area sources, terrain landforms, seasonal wind frequencies, and distances between the receptors and pollutant sources. The Pollution Exposure Index is then calculated using digital elevation files, prevailing wind frequency data between pollutant sources and receptors, seasonal and annual mixing height, EPA and State pollutant source data for area and point sources of carbon monoxide, nitrous oxide, sulfur dioxide, volatile organic compounds, particulate matter, and lead. The GIS computer programs of Arc/Info and ArcView are used to estimate and map a Pollution Exposure Index.

Receptors could include acid sensitive high acid sensitive high elevation lakes of a Class I wilderness area, visually sensitive vistas, and air pollution sensitive biological or cultural features. Upwind sulfate emissions from a power plant can be mapped as Pollution Exposure Index contours over the lake watershed to see potential pollutant impacts.

The Pollution Exposure Index offers much utility in Forest Plan revisions, NEPA analysis and permit reviewing. At the Forest Plan level, it should be used to help define air quality issues, to describe the affected environment, to evaluate proposed alternatives and focus future air quality monitoring. In NEPA analysis, it should be used to highlight where pollution sensitive areas are which allows the user to better address the affected environment and consider the consequences of proposed management activities. In permit reviewing, it should be used as a first evaluation of whether or not a proposed source's emissions will impact an area.

Smoke Management

State Airshed Group

Historically, fire, and therefore smoke, have been a part of the Northern Rockies ecosystem. Currently, smoke is a very sensitive issue in many areas of the Region both from a health and visibility perspective. Several communities in Montana and Idaho are non-attainment for particulate matter which can be exacerbated by smoke impacts. To minimize impacts, the Region participates in the Montana and north Idaho State Airshed Groups, which are self-regulated cooperatives of major open burners in Montana and Idaho. The smoke management cooperative uses fuels and weather information combined with burning restrictions to disperse, dilute and minimize smoke impacts in local communities.

The Montana and Idaho air regulatory agencies recognize the current smoke management practices of the Airshed Groups as Best Available Control Measures for prescribed burning.

Training and Background

A formal smoke management techniques course, RX-450, is offered at the Regional and National level. The contents of the course include managing and monitoring smoke and becoming involved in the air quality rule making process. Smoke modeling courses have also been developed and are continually being improved to help managers estimate smoke impacts.

Weather Program

An agreement between the Regional Office and the Bitterroot National Forest for assistance in air resources and weather management was developed in 1992. A weather committee was established to coordinate and develop a Regional weather system to interact with the new Weather Information Management System and the network of weather stations maintained by Fire, Aviation and Air. The weather committee coordinates Regional weather information needs with emphasis on climate requirements for sustainable ecosystem management. The objective of the weather program is to identify and coordinate weather information sources and applications for all resources.

The Weather Information Management System is being implemented by Forests throughout the nation as well as by National Park Service, Bureau of Land Management, and state agencies. Present emphasis is focused on fire weather information, especially the daily manual and automated fire danger rating system information, but the system includes access to National Weather Service computer graphic products. Other resource needs for weather information will be met by the Weather Information Management System, as well as other systems like the Natural Resource Conservation Service Climate Data Access Facility at Portland, Oregon.

Air resource management needs for weather information include visibility, which in itself is a meteorological measurement. Regional and local visibility are expressions of synoptic and meso or micro scale meteorology, respectively. Historic weather data of relative humidity, atmospheric stability, wind, and precipitation are analyzed to interpret visibility effects of air emissions.

Smoke dispersion, direction, and concentrations can be predicted based upon weather information. Remote automated weather stations can be combined with air quality samplers to evaluate air quality. For example, a high elevation automatic weather station has been installed above Missoula to augment atmospheric stability and dispersion condition information.

The Pollution Exposure Index mentioned earlier uses prevailing winds and atmospheric conditions.

Regional wilderness lake water and sediment chemistry surveys and lichen surveys are correlated with weather information to assess emission sources as well as model potential pollutant effects. Precipitation and chemistry are being evaluated at Lost

Trail Pass for correlation with aquatic ecosystems. Visibility monitoring at Sula Peak and Stevensville Ranger District are being correlated with weather information as well as smoke emissions.

Ecosystem modeling uses weather data to characterize the effect of average, wet, and dry conditions on landscapes including airsheds with histories of fire and smoke effects. Global warming potential from carbon dioxide increases is being modeled for ecosystem effects. A computer file of weather information sources and applications is planned (Appendix 8) to assist all weather information users in ecosystem management, including air resources management.

NORTHERN REGION AIR RESOURCE MONITORING

AQRV MONITORING AND SURVEY PLANS

To enable the Region to meet Congressional and Chief's directions, AQRV monitoring plans have been developed for each Class I Wilderness to assure that AQRVs are monitored and protected. Forest Supervisors are responsible for identifying AQRVs and completing and implementing monitoring plans. AQRV monitoring plans are critical to the Prevention of Significant Deterioration regulatory process and protecting resources from future air pollution impacts. A similar plan will be prepared for the Class II Absaroka Beartooth Wilderness which will be incorporated into its Wilderness Implementation Schedule.

Specific AQRV inventory and monitoring plans have been prepared by the Forests for each of the Class I Wilderness areas in Region 1 (except for the Hells Canyon Wilderness Area on the Nez Perce NF which is administered by the Wallowa-Whitman NF in Region 6). These plans include a specific analysis of existing and potential air pollution problems which could affect Wilderness AQRVs. The plans establish the appropriate inventory and monitoring program for each Class I area. Baseline conditions of AQRV's and known information is summarized in Appendix 9. The AQRV plans, Forests, and completion years are shown below.

AQRV Monitoring Plans Completed

CLASS 1 WILDERNESS AREA	YR	FOREST
Bob Marshall	89	Flathead, Lewis and Clark
Cabinet Mountains	93	Kootenai
Gates of the Mountains	93	Helena
Selway Bitterroot	93	Bitterroot, Clearwater, Nez Perce
Anaconda Pintler	94	Deerlodge, Bitterroot, Beaverhead
Mission Mountains	96	Flathead
Scapegoat	97	Helena, Lewis & Clark, Lolo

Contact the Forests or the Regional Office Air Staff for copies.

Appendix 10 schedules specific monitoring items by Forest from 1997 through 2002. Specific known monitoring items and costs are displayed by Forest by year.

Lake Monitoring

Lake monitoring in Region 1 has included a three-phased program initially measuring a few parameters at many lakes followed by more intensive analysis at a few long term benchmark lakes.

Phase 1 lake monitoring included measuring pH, alkalinity, conductivity, and documenting watershed factors (geology, vegetation, drainage characteristics) of 146 lakes.

Phase 2 lake monitoring protocols repeat Phase 1 plus measure cations (calcium, magnesium, sodium, potassium, ammonium) anions (fluoride, chloride, nitrate, sulfate), silica, phosphorus, and aluminum. The Phase 2 parameters allow more specific understanding of lake chemical characteristics in relation to watershed factors which facilitates the selection of Phase 3 lakes. Phase 2 monitoring has been done on 176 lakes.

Phase 3 "benchmark" monitoring of lake chemistry conditions over several years is designed to establish trends in lake chemistry and lake ecology. Phase 3 parameters include one or two times sampling of Phase 2 parameters plus organic nitrogen (kjeldahl), organic carbon, chlorophyll A, and periodic qualitative identification of phytoplankton species. Phase 3 lakes include Upper and Lower Libby lakes in the Cabinet Mountains Wilderness, Shasta and North Kootenai Lakes in the Selway Bitterroot Wilderness, and Twin Island and Stepping Stone Lakes in the Absaroka Beartooth Wilderness. Phase 3 monitoring needs to be conducted for at least 7-10 years to establish clear trends.

Acid Deposition Modeling

Acid deposition modeling using MAGIC/WAND (Model of Acidification of Groundwater in Catchments/With Aggregrated Nitrogen Dynamics) was completed for Upper and Lower Libby Lakes in the Cabinet Mountains Wilderness in February 1997. The MAGIC/WAND model calibrates lake chemistry to atmospheric deposition and watershed/soil/hydrology factors enabling predicting lake chemistry response to potential upwind changes in emissions. The model is extremely useful in Prevention of Significant Deterioration analysis. MAGIC/WAND calibrations are scheduled for the Phase 3 lakes in the Selway Bitterroot Wilderness (1997) and Absaroka-Beartooth Wilderness (1998). The model is extremely useful in Prevention of Significant Deterioration analysis. The MAGIC model calibrations require:

1) At least two years of Phase 3 lake chemistry information

2) A survey of soil depth, cation exchange capacity (calcium, magnesium, sodium, potassium), base saturation, soil pH, bulk density, and porosity for each of the major soil types in the watershed above the lake

3) An estimate of percent carbon and nitrogen in leaves for at least eight dominant plant species in each lake watershed

4) A map of rock outcrops, permanent snow fields, and vegetation in the lake watershed

5) A characterization of dominant rock minerals

6) A plot of stream network upstream of the lake

6) A depth profile for lake volume

7) An estimate of annual water routing through the lake watershed including average annual precipitation, evapotranspiration, total discharge into and out of the lake, and lake retention time.

8) A characterization of deposition chemistry from the nearest NADP site (Glacier National Park for Cabinet Mountains Wilderness, Lost Trail Pass for Selway Bitterroot Wilderness, and Tower Junction (Yellowstone National Park) for Absaroka-Beartooth Wilderness.)

The MAGIC/WAND model calibrations are not practical for lakes with acid neutralizing capacity greater than 50 μeq/liter since these lakes are not likely be acidified in any reasonably foreseeable acid deposition scenario. This factor negates the need to conduct MAGIC/WAND model calibrations in the Anaconda Pintler, Bob Marshall, Scapegoat, and Mission Mountain Wilderness Areas. Increased emissions in those areas would trigger Prevention of Significant Deterioration increments and visibility contrast limits at emission levels much less than would have to occur to initiate acidification of these moderately to highly buffered systems.

The actual MAGIC/WAND model calibrations are being contracted with E&S Environmental Chemistry of Corvallis, Oregon. A final product will be a PC format for use by Region 1 personnel.

Visibility Monitoring

Monitoring has occurred to characterize the visibility of the Bob Marshall, Cabinet Mountains, Selway Bitterroot and Anaconda Pintler Wilderness Areas. Current visibility monitoring is focused on the Selway Bitterroot and Anaconda Pintler Wilderness areas. Sula Peak Lookout on the Bitterroot NF has a visibility camera and an ambient air quality monitor to document and characterize the components in the air and how they affect visibility. This information, combined with that from other visibility sites, will be used to establish visibility conditions in the Region.

DATABASE, ANALYSIS, AND REPORTING

The purpose of inventorying and monitoring of AQRV's is to produce scientifically and legally credible information for use in the air regulatory process. Data storage

and appropriate analysis are essential to extract meaningful information. The intent of the monitoring program is to establish baseline conditions of sensitive receptors. Some of the receptors will be monitored over several years to evaluate trends, such as the chemistry of Phase 3 lakes. Analysis generally includes statistical evaluations, modeling, and comparisons with available literature or unpublished information to determine if AQRV's are being protected from adverse changes due to air pollution. Procedures for data base, analysis, and reporting will vary considerably by the parameter being monitored.

National Atmospheric Deposition Program (NADP)

The NADP chemistry and precipitation database is managed by the Natural Resource Ecology Laboratory (NREL) in Fort Collins, CO. The Bitterroot NF receives data summaries for the Lost Trail Pass site. The Natural Resource Ecology Laboratory distributes annual and semi-annual data reports for the national network. The Natural Resource Ecology Laboratory can send data in disks in Lotus format. In addition, NADP data can be retrieved on the NADP internet WEB site at:

http://nadp.nrel.colostate.edu/nadp/sitelist.html.

Currently the NADP data is being loaded into Quattro Pro PC files for a variety of analysis methods including calculation of monthly and quarterly averages, annual wet deposition rates, and graphic display of trends.

The Lost Trail Pass NADP data will be evaluated at least every two years with a summary report prepared and sent to the Bitterroot NF.

Lake Data

Lake data collected in the Bob Marshall Wilderness is analyzed, evaluated, and reported by Bonnie Ellis and Jack Stanford of the Flathead Lake Biological Station (U. of Montana). Reports have been prepared and distributed for 1989, 1990, 1991, 1992, 1993, and 1994.

Phase 1, Phase 2, and Phase 3 chemistry data is loaded into Quattro Pro 3 files. This allows a wide variety of simple statistical tests and graphic analysis as well as the convenience of quickly transmitting the data to users. More comprehensive statistical tests are done with STATGRAPHICS. Lake analysis consists of:

1) Evaluating data quality by calculating average values and standard deviations, comparing lake samples with duplicate and blanks, camparing % ion difference between cations and anions, comparing Phase 1 and Phase 2 data for the same lakes, and comparing the Phase 2 data with the 1985 Western Lake Survey.

2) Evaluating relationships between parent material, geochemistry, and water chemistry.

3) Comparing lake data to screening criteria.

4) Evaluating XY graph parameter plots such as calcium versus conductivity, silica versus cations, and gran ANC versus conductivity

5) Analyzing time trends for Phase 3 lakes

6) Reviewing literature for phytoplankton algae, benthic algae, and chlorophyll A biomass in Phase 3 lakes

Biological parameters (such as phytoplankton) are identified, evaluated, and reported by contractors such as the Flathead Lake Biological Station for the Bob Marshall Wilderness lakes.

Phase 1, 2, and 3 lake data have been statistically analyzed, evaluated, and reported each year. Reports are sent to respective Forests as well as to several interested non-NFS agencies and people. Phase 3 data time trend analysis will be evaluated and reported at least every 2 years.

Visibility Data

Visibility data for the Bob Marshall, Cabinet Mountains, and Selway Bitterroot Wilderness areas was analyzed and reported by Acheson (1993).

Representative slides of the least, greatest, and median standard visual range (SVR) are sent quarterly from the visibility contractor (Air Resource Specialists, Inc. of Fort Collins) to the Regional Office and to the respective Forests. Quarterly reports, which include floppy disks, of all Forest Service camera sites nationwide are sent to the Regional Office.

The cumulative frequency of standard visual range is listed for each site. The contrast between the terrain and the sky is calculated and then converted into standard visual range. Median and 90th percentile standard visual range are calculated in relation to the target distance in the photos.

A report from the group which represents the Interagency Monitoring to Protect Visual Environments (IMPROVE) is expected in 1997 which will document visibility conditions of the Selway Bitterroot/Frank Church River of No Return/Anaconda Pintler Wilderness. Fine particulate matter of less than 2.5 microns in diameter affects visibility. Fine particulates have been monitored with IMPROVE module A samplers since December 1993 on Baldy Mountain near Salmon, Idaho, and since August 1994 on Sula Peak near Sula Montana. A comparison of regional and local visibility conditions will be made between the sites located at Baldy Mountain on the Salmon NF, and Sula Peak on the Bitterroot NF.

Lichen Data

Lichen evaluations consist of an initial inventory of species composition, abundance, and chemistry of the lichen thallus material. Analysis and reporting are prepared by Dr. Larry St. Clair and a draft is distributed to the Regional Office and the respective

Forests within a year of inventory. Lichens surveys in 1992-1994 in the Selway Bitterroot, Anaconda Pintler, and Cabinet Mountain Wilderness will be reinventoried in about the year 2000.

Particulate Data

Particulate matter less than 10 microns in diameter is monitored at Stevensville and West Fork Ranger Districts, Bitterroot National Forest. Hourly data at Stevensville is input to the EPA national database by the Montana Department of Environmental Quality. They also input the 24-hour average PM-10 data taken every sixth day at Stevensville and West Fork. Annual interpretative reports are available for August 1994 - August 1995, and for August 1995 - August 1996, showing the ambient PM-10 as well as nearby and long distance upwind wildfire levels. Correlation of particulate matter concentration with visibility photographs is included. Sula Peak IMPROVE PM-2.5 is also used in the annual PM-10 reports.

National Database System

An Air Resource Monitoring System (ARMS) is being developed at the national level as pert of the Common Survey Data Structure. The Air Resource Monitoring System is being designed to incorporate most of the air and weather related information generated by the Forest Service including visibility, air quality, weather, flora, water, and fauna. Much of Region 1's air related monitoring data will be incorporated when the Air Resource Monitoring System becomes operational.

TRAINING

The most intensive technical training has been invested in Region 1's air quality specialists (Ann Acheson and Mark Story) and weather program coordinator (Bob Hammer). This training consists of workshops and courses (such as EPA correspondence courses) in Prevention of Significant Deterioration reviews and other air quality regulatory issues, emission dispersion modeling, air quality modeling, visibility modeling, and weather related training and workshops.

Air Resource Management requires not only technical knowledge of air quality but information from many natural resource disciplines. It is fortunate, therefore, that Forest and District personnel involved in local air quality issues have expertise in other resources. An individual's education and experience in natural resources is useful for additional training in ARM. Most training opportunities for Region 1 personnel are on-the-job. It is important that Forest Air Contacts be knowledgeable about Clean Air Act legislation and regulations, dispersion modeling, air pollution effects, and budgeting. As the Air Quality Program in Region expands, the largest increase in air quality knowledge will likely result from training existing personnel rather than hiring new air quality specialists.

Individuals may attend as necessary EPA courses or workshops, and courses sponsored by state agencies, universities, or federal agencies. Suggested EPA self-study courses include:

S1:422	Air Pollution Control Orientation Course
S1:448	Diagnosing Vegetation Injury Caused by Air Pollution
S1:451	Introduction to PM10 SIP Development
S1/ST:453	Overview of Prevention of Significant Deterioration Regulations
S1:409	Basic Air Pollution Meteorology
S1:410	Introduction to Dispersion Modeling

These are free courses offered through the EPA Air Pollution Training Institute. Contact the Air Pollution Training Institute at: Environmental Research Center MD 17, Research Triangle Park, NC 27711, (919) 541-2497 for an updated course catalog.

The Air & Waste Management Association also offers annual courses in air pollution effects and air quality legislation. Contact them at P.O. Box 2861, Pittsburgh, PA 15230, (412) 232-3444 for further information.

APPENDIX 1

AIR RESOURCE MANAGEMENT RESPONSIBILITIES

Regional Foresters have the following responsibilities (from Forest Service Handbook 2509.19):

A. Provide regional, station and area leadership and direction in air resource matters affecting lands under their jurisdiction.

1) Consider present and potential effects on AQRVs in planning and implementing all resource protection and management activities.

2) Establish background conditions of AQRVs in Prevention of Significant Deterioration Class I areas using acceptable techniques.

3) Establish screening procedure and values that will protect AQRVS

4) Monitor the effects of air pollution, including atmospheric deposition, on forest resources that will:

a) Assure that the national standards and special protection requirements for Class I areas are being met.

b) Obtain useful data describing the air resource to support other Forest Service management activities such as smoke management, resource management plans and reclamation activities.

c) Determine air resource impacts to and/or adverse effects on National Forest resources due to man-caused emission sources.

d) Develop baseline data for modeling potential impacts from proposed new emission sources.

e) Support multiagency monitoring programs when it is in the Forest Service or national interest. Monitoring will be conducted in coordination with other data user groups whenever feasible.

5) Provide consultation, technical assistance and training to forest resource managers and specialists.

B. Provide continuing liaison with federal, state and local government agencies having responsibilities for air quality regulations and participate with them when regional, state or local air quality standards or regulations affecting forest resources are being developed.

C. Ensure compliance of all agency activities with requirements of the Clean Air Act and with federal, state, and local air quality regulations. Ensure conformity to the

appropriate State Implementation Plan of all Forest Service or Forest Service authorized or permitted activities.

Forest Supervisors have the following responsibilities:

A. Identify AQRVs, sensitive receptors and desired future conditions for their wilderness.

B. Develop monitoring to determine the status of the above parameters. Forward data and information to the Regional Forester to aid in fulfilling the Regional Forester's responsibility.

C. Incorporate AQRV monitoring plans into the next revision of Forest Plans.

D. Aid in the review of Prevention of Significant Deterioration permits and air quality issues identified in Environmental Impact Statements (EISs).

E. Determine the air quality budget needs of the forest and forward those needs to the Regional Office.

F. Identify the air quality training needs of the forest staff, forward those needs to the Regional Office for review, and schedule needed training.

Forest Air Contacts have the following responsibilities:

A. Support the Forest Supervisor in fulfilling the above responsibilities in air resource management.

B. Take the lead in planning and preparing the air quality budget for the Forest.

C. Be the communication contact between the Regional Office and the Forest on air quality related issues including (but not limited to) air quality regulations, air quality related values inventory and monitoring, global climate change, and NFMA and NEPA concerns.

D. Disseminate air resource management information to Districts and other interested parties on the Forest.

E. Attend, or send a suitable substitute to, air resource management training sponsored by the Regional Office.

APPENDIX 2

CLASS I AND CLASS II AREAS IN THE NORTHERN REGION

Under the 1977 Clean Air Act amendments (42 U.S.C. 7401 et seq.), areas of the country could be designated as Class I, II, or III for Prevention of Significant Deterioration purposes with the option that Class II and III areas could be upgraded to Class I.

Class I areas are all international parks, national parks greater than 6000 acres, and national wildernesses greater than 5000 acres which existed on August 7, 1977. This class provides the most protection to pristine lands by severely limiting the amount of additional air pollution which can be added to these areas. The seven Forest Service Class I areas in the Northern Region are:

Wilderness	***Forest(s)***
Selway-Bitterroot	Bitterroot, Clearwater, Nez Perce
Anaconda-Pintler	Bitterroot, Beaverhead, Deerlodge
Bob Marshall	Flathead, Lewis & Clark
Cabinet Mountains	Kootenai
Gates-Of-The-Mountains	Helena
Mission Mountains	Flathead
Scapegoat	Helena, Lewis & Clark, Lolo
Hells Canyon*	Nez Perce

*Hell's Canyon is administered by the Wallowa-Whitman National Forest in Region 6.

Other Class I areas within Region 1 are Glacier, Yellowstone, and Theodore Roosevelt National Parks, the Northern Cheyenne, Flathead, and Fort Peck Indian Reservations and Medicine Lake, Red Rock Lake, and UL Bend Wildlife Refuges.

Class II areas are all other areas of the country. These areas may be upgraded to Class I. A greater amount of additional air pollution may be added to these areas. All Forest Service lands which are not designated Class I are Class II lands.

Class II Wilderness Areas in Region 1 are:

Wilderness	***Forest(s)***
Absaroka Beartooth	Gallatin, Custer
Gospel Hump	Nez Perce
Great Bear	Flathead
Lee Metcalf	Gallatin, Beaverhead
Rattlesnake	Lolo
River of No Return#	Nez Perce, Bitterroot
Welcome Creek	Lolo

#The River of No Return Wilderness is managed jointly by Region 1 and Region 4. Region 4, however, manages their portion of the Wilderness as a Class I area.

Class III areas have the least amount of regulatory protection from additional air pollution. To date, no Class III areas have been designated anywhere in the country.

APPENDIX 3

*AMBIENT AIR QUALITY STANDARDS**

For Six Criteria Pollutants & Visibility
(in μg/m^3 unless otherwise stated)

POLLUTANT	AVERAGING TIME	FED'L STND	MONTANA STANDARD	IDAHO STANDARD	NDAKOTA STANDARD
Particulate Matter (PM-10)	Annual 24-Hour	50 150	50 150	50 150	50 150
Nitrogen Dioxide (NO_2)	Annual 1-Hour	100 ---	100 566	100 ---	100 200
Carbon Monoxide (CO)	8-Hour 1-Hour	10,000 40,000	9 ppm 23 ppm	10,000 40,000	10,000 40,000
Sulfur Dioxide (SO_2)	Annual 24-hour 1-hour	80 365 ---	.02 ppm (52.4μg/m^3) .10 ppm (262 μg/m^3) .50 ppm (1810 μg/m^3)	80 365 ---	60 260 715
Ozone (O_3)	1-hour	235	.10 ppm	.12 ppm (235 ug/m3)	235
Lead (Pb)	Calendar	1.5	1.5	1.5	1.5
Visibility	Annual	---	3 x 10^{-5} meter (scattering coefficient)	---	---

* Annual standards are never to be exceeded. Other standards are not to be exceeded more than once a year.

APPENDIX 4

NON-ATTAINMENT AREAS IN MONTANA and NORTHERN IDAHO

STATE	CITY	PM-10	CO	SO2	Pb
MONTANA	Butte	xx			
	East Helena			xx	
	Laurel			xx	
	Great Falls	xx	xx		
	Missoula	xx	xx		
	Kalispell	xx			
	Columbia Falls	xx			
	Libby	xx			
	Thompson Falls	xx			
	Whitefish	xx			
	Billings		xx	xx	
TRIBAL	Lame Deer	xx			
	Polson	xx			
	Ronan	xx			
IDAHO	Sandpoint	xx			
	Pinehurst	xx			
	Shoshone County (parts)	xx			
	Kootenai County (proposed)	xx			

APPENDIX 5

MAJOR STATIONARY SOURCES IN MONTANA

Montana Stationary Sources of Air Pollution (greater than 100 tons per year)

SOURCE	PM10	SO2	NOX	VOC	Pb	TONS POLL	COUNTY
Spring Creek Coal	192	18	202	23	0	435	Bighorn
Decker Coal	929	54	417	34	0	1434	Bighorn
Westmoreland Res.	257	15	135	14	0	421	Bighorn
Havre Pipeline LLC	4	2053	10	87	0	2144	Blaine
Continental Lime	143	5	238	8	0	394	Broadwater
Mont Pwr-Redlodge	0	0	100	25	0	125	Carbon
Dept. AF/Malstrom	1	17	96	0	0	114	Cascade
FH Stoltze L&T	65	1	4	44	0	114	Flathead
American Timber Co	89	4	20	41	0	154	Flathead
Plum Crk-Evergreen	69	8	144	84	0	305	Flathead
Plum Creek-CF	367	14	405	396	0	1182	Flathead
Columbia Falls Al	504	1262	10	390	0	21650	Flathead
Louisiana Pacific	85	1	10	74	0	170	Gallatin
Luzenac America	62	4	41	3	0	110	Gallatin
Holnam, Inc.	187	32	1330	2	1	1552	Gallatin
Mont. Tunnels Mine	190	44	408	31	0	673	Jefferson
Golden Sunlight Mi	475	40	407	27	0	949	Jefferson
Ash Grove Cement	139	84	491	1	1	716	Lewis & Clk
ASARCO	195	13225	25	0	21	13494	Lewis & Clk
Luzenac America	62	4	41	3	0	110	Madison
Stimson Lumber	131	10	181	90	0	412	Missoula
Louis. Pac. Corp.	133	2	18	163	0	316	Missoula
Stone Container Co.	487	165	2059	883	0	3594	Missoula
Louis Pac. Deerlodge	76	2	19	79	0	176	Powell
Zortman-Landusky	772	60	544	27	0	1403	Phillips
MT-Dakota Utility	29	1006	896	8	0	1939	Richland
Holly Sugar	153	57	29	19	0	258	Richland
N.Cheyene P-Ashlnd	86	1	4	9	0	100	Rosebud
Western Energy	1025	76	471	36	0	1608	Rosebud
Big Sky Coal Co.	427	26	238	18	0	709	Rosebud
Coalstrip Energy	10	1044	662	9	0	1725	Rosebud
MPC-Colstrip 1&2	91	9633	97	51	0	9872	Rosebud
MPC-Colstrip 3	147	3310	16177	199	0	19833	Rosebud
Koch Hydrocarbon	2	2	166	0	0	170	Roosevelt
Beal Mountain Mine	73	13	119	11	0	216	Silverbow
Montana Resources	1062	44	396	41	0	1543	Silverbow
SOURCE	PM10	SO2	NOX	VOC	Pb	TONS	COUNTY

						POLL	
Rhone Poulenc Chem	96	263	194	1	0	554	Silverbow
Stillwater Min-Nye	58	8	90	8	0	73	Silverbow
Montana Pwr Shelby	0	16	122	43	0	181	Toole
Williston Bsn-Saco	1	0	327	85	0	413	Valley
Williston B Ft.Pck	1	0	81	26	0	108	Valley
Yellowstone Energy	3	811	137	12	0	963	Yellowstone
Montana P-Billings	100	6439	3467	24	0	10030	Yellowstone
Conoco	121	959	700	790	0	2570	Yellowstone
Mt. Sulphur	1	3422	11	0	0	3434	Yellowstone
Cenex	136	2865	892	1295	0	5188	Yellowstone
Exxon	252	8738	736	1082	0	10808	Yellowstone
Western Sugar	49	486	360	17	0	912	Yellowstone
TOTALS	**8537**	**54319**	**35803**	**6313**	**23**	**105955**	**All**

APPENDIX 6

MAJOR STATIONARY SOURCES IN NORTHERN IDAHO

Northern Idaho Major Stationary Sources of Air Pollution (greater than 90 tons per year)[1]

SOURCE	PM	CO	SO2	NOx	VOC	COUNTY
Potlatch Corp. Edwards Lumber Mill	52	1638	10	45	109	Benewah
Potlatch Corp. St. Maries Complex	832	1890	12	176	163	Benewah
Rayonier Inland	98	544	3	60	9	Benewah
Regulus Stud Mill	101*	69	2	5	10	Benewah
Ceda-Pine Veneer	70	28	1	5	12	Bonner
Crown Pacific Inland (formerly D.A.W.)	310	200	49	28	47	Bonner
Louisiana Pacific	121	202	3	58	28	Bonner
Loiusiana Pacific - Priest River	142*				3	Bonner
Pacific Gas Transmission - Samuels Compressor	3	21	2	349	<1	Bonner
Riley Crk Lumber	413*	374	8	62	190	Bonner
Crown Pacific Inland	145	100	1	6	2	Boundary
Louisiana Pacific	37	96	3	60	25	Boundary
Pacific Gas Transmission Co. (Eastport Compressor)	7	402	3	814	8	Boundary
Potlatch Corp. Jaype Plywood	415	777	10	88	96	Clearwater
Clearwater Forest	100*	189	1	21	28	Idaho
IdaPine Mills	170	11	2	31	3	Idaho
Seubert Excavators	184	1	<1	6	<1	Idaho
Shearer Lumber	243*	159	1	21	3	Idaho
Three River Timber	869	1084	6	28	58	Idaho
Gem State Lumber	70	172	1	5	9	Latah
University of ID	39	28	3	42	4	Latah

[1]Information based on most recent fee data collected from the sources. Most recent is generally 1993.
*Described as Total Suspended Particulate (TSP) instead of PM.

Bennett Lumber	61*	259	1	29	4	Latah
Kamiah Mills	34	23	<1	3	34	Lewis

SOURCE	**PM**	**CO**	**SO2**	**NOx**	**VOC**	**COUNTY**
Potlatch Corp. Lewiston Complex	650	5657	359	2120	395	Nez Perce
BTU Energy (Proposed)	7	75	18	98	17	Kootenai
Crown Pacific (formerly D.A.W.)	150	231	3	13	5	Kootenai
Harpers, Inc	9			17	199	Kootenai
Idaho Forest Industries	100	79	1	24	10	Kootenai
Idaho Forest Industries - Dearmond Division	90	78	2	37	15	Kootenai
Idaho Veneer	140	114	1	7	4	Kootenai
Imsamet	94	14	24	45	39	Kootenai
Louisiana Pacific, Chilco	81	172	7	30	266	Kootenai
Louisiana Pacific, Post Falls	110*	172	1	5	9	Kootenai
Pacific Gas Transmission Co., Athol Compressor	7	447	2	948	9	Kootenai
Potlatch Corp, Post Falls	288	201	1	22	60	Kootenai
Washington Water Power Co.	32	240	13	235	8	Kootenai
TOTALS	**6274**	**15747**	**555**	**5554**	**1883**	**ALL NO. COUNTIES**

APPENDIX 7

COLUMBIA RIVER BASIN ASSESSMENT

AIR POLLUTION SOURCES AND NON-ATTAINMENT AREAS

From: Schoettle, et al. in press.

APPENDIX 8

SOURCES OF WEATHER INFORMATION

b.hammer, 12/20/96

Introduction

Weather is a condition of the atmosphere at a particular place and time, while climate is the prevailing average and extreme weather conditions of a place over a period of years. Weather and climate database sources presented are selections which are hoped to be useful for natural resources management activities such as: environmental assessment reporting; ecosystem, watershed, and air quality modeling; vegetation classification and phenology; silviculture; range and fire management; tree planting; recreational activities; water supply management; insect and disease control; and road or trail construction and maintenance.

Databases are distinguished by being either historic/archived or interactive/real time. Comments on data quality, cost, period of record, and uses are included with available sources. Databases must include metadata, which is information about the data site and instrumentation. Sources of weather information and potential applications will be a dynamic file with updating as new information and needs arise. User feedback will be appreciated and used to make this weather source information most useful.

The Internet is evolving daily and is becoming an important major source of weather information and a network connecting weather data systems. An interagency effort is underway to make a unified climate access network (UCAN). A brief introduction to Internet and UCAN are included in the following weather source systems of use to resource management.

Specific Weather Databases

1. **National Climatic Data Center (NCDC)**
   The largest climate data center in the world, operated by National Oceanic and Atmospheric Administration of US Dept of Commerce, is located in Asheville, NC. NCDC contains all historical US weather records generated by NOAA and its predecessor agencies. NCDC databases are mostly from national networks such as radar, airway surface observations, and upper air soundings. Cooperative observer daily weather observations are included.

source: NCDC phone: (704) 271-4800
151 Patton Avenue, Room 120
Asheville, NC 28801-5001

internet = http://www.ncdc.noaa.gov/

data storage: computer tapes, microfiche, paper, data cassettes

data types: historic; all weather parameters; 215 separate data sets, historical publications, special studies, statistical tabulations, climatological analyses, and analyzed weather charts. On-line data access includes downloadable climate and satellite data; surface daily, monthly, and other data types; inventory systems; NEXRAD services directory; and publications.

use: all weather information applications of NOAA databases

period of records: 1850's to present

data quality/comments: quality control varies according to data set; good summaries and data management; usually valley, not wildlands, locations for data collection. NCDC does not maintain most non-NOAA databases for the western US.

cost/time: charges for most NCDC data, including other federal agencies; long time (a month) to obtain some requested data; on-line data access

2. ***Western Regional Climate Center (WRCC)***

The National Oceanic and Atmospheric Administration in cooperation with other agencies and universities administers six Regional Climate Centers to provide national coverage of regional climatic databases. The Western Regional Climate Center is affiliated with the Desert Research Institute in Reno, NV, and has memorandum of understanding with the Forest Service and Bureau of Land Management to enhance the utilization of RAWS meteorological data. States served are MT, ID, WA, OR, CA, NV, UT, AZ, NM, WY, CO, AK, HI, and Pacific Islands. The WRCC is a leader in UCAN and the Internet for weather and climate information.

source: Western Regional Climate Center (WRCC)
P.O. Box 60220
Reno, NV 89506-0220

Director: Dr. Richard Reinhardt, 702-667-3103,
internet = rrwrcc@nimbus.sage.unr.edu
Regional Climatologist: Dr. Kelly Redmond, 702-677-3139,
internet = krwrcc@nimbus.sage.unr.edu

generic: 702-677-3106 voice, 702-677-3157 fax,

internet = wrcc@nimbus.sage.unr.edu
internet = http://wrcc.sage.dri.edu/

data storage: computer tapes, paper, disk on-line

data types: primarily historic, but also some interactive databases; all weather parameters; 6100 stations for the 14 western most states; historical database updated twice each month; all hourly data from FAA and NWS kept on-line for at least one year; period-of-record RAWS 24 hourly observations maintained on-line; useful graphical statistics over the Internet showing maximums, minimums, and means for climatic parameters for all weather stations by states and stations which can be clicked on by personal computer mouse using the World Wide Web; very involved in UCAN

use: all weather information applications

period of records: 1850's to present

data quality/comments: varies according to data set; good data management; can coordinate with WRCC to adapt to forestry data sources and applications and produce specific data products

cost/time: small charges for all data; telephone requests met within about a day; developing menu-driven user-accessible remote access system to directly query the data

3. ***National Agriculture Water and Climate System***

The Natural Resources Conservation Service (NRCS), formerly called Soil Conservation Service, Portland, OR, has a Centralized Database System, until recently called the Climatic Data Access Facility Systems, with NRCS SnowTelemetry (SNOTEL) data, NRCS Global Change data, NWS cooperative climate data from national network and a variety of hydrologic data. SNOTEL sites are located throughout western rangelands and mountain watersheds, and provide daily remote high elevation snowpack, precipitation, and temperature data.

source: Natural Resources Conservation Service
101 SW Main Street, Suite 1600
Portland, OR 97204-3224

Administrative contact is Phil Pasteris, 503-414-3058, A16PPasteris@ATTMAIL.COM.

Technical contact is Jim Marron, 503-414-3047, A16JMarron@ATTMAIL.COM.

Internet access is evolving over World Wide Web. Very involved in UCAN. Accounts and passwords are often assigned by state. Contact NRCS state office, Climate Data Liaison or Snow Survey staff, in Boise and Bozeman.

Cooperator manuals and on-line training in data access as well as assistance in obtaining climate databases are readily available through the Snow Survey Data Collection and Water Supply Specialist staff in each state office. Bozeman contacts are Roy Kaiser, (406) 587-6991, and Jerry Beard, 587-6843. Boise NRCS Snow Survey number is (208) 334-1614.

data storage: computer tapes, disk storage

data types: historic and interactive; precipitation, temperature, snow depth, snow water content primarily, but other weather parameters on some sites. Excellent summary reports including interpretations relative to water supply. Trend toward more environmental parameters with global climate monitoring. GIS maps using Oregon State University PRISM model.

use: water supply forecasting related to snowpack, precipitation, and soil moisture. Other environmental parameters possible make applications potential unlimited, especially relating to remote rangelands and mountain watersheds. GIS maps for all ecosystem management needs.

period of record: most SNOTEL from about 1980 to present. Includes NOAA station data from 1850's (very few prior to 1948) to present.

data quality/comments: good data management and site equipment is well maintained. Excellent help at state offices and Portland center. Can obtain any data set in a timely manner with no charge. Addition of sensors to SNOTEL is a simple matter of working with state Snow Survey personnel, usually costing only sensor purchase price, with operation and maintenance by the NRCS.

cost/time: no cost and rapid, near real time data interaction possible

4. **Weather Information Management System (WIMS)**

The Weather Information Management System (WIMS) became available on the USDA National Information Technology Center in Kansas City, MO, in April, 1993. WIMS is a replacement for the Administrative Forest Fire Information Retrieval and Management System (AFFIRMS) as a host for the National Fire Danger Rating System. WIMS provides a gateway to National Weather Service computer graphics products in the Automated Forecasting and Observing System (AFOS). WIMS is intended to expand from traditional fire weather data management to a system for all weather data users in natural resources management.

source: WIMS
National Information Technology Center
8330 Ward Parkway
Kansas City, MO 64114

WIMS is an interactive database system for DG and PC use by Forest Service, BLM, NPS, and other agencies including state personnel. User support and system administration are provided by staff located in Boise, ID. Phone number for WIMS support is 1-800-253-5559 or 208-387-5287, and DG address is FIRE?:W02A. Each National Forest's fire management staff has WIMS user expertise.

data storage: on-line relational database

data types: interactive and batch, with historic data. Mainly 1300 hour fire weather data such as temperature, precipitation, humidity, lightning activity level, state of the weather, wind speed and direction. Both manual and RAWS data. One year of on-line 24 hour daily RAWS data. Wide variety of NWS graphics AFOS products available by PC connection through WIMS.

use: fire weather is immediate use, but other resources can use the data and NWS products. Software programs will be added to statistically work with the data to aid in resource management decision making.

period of records: One year of 24 hour daily data is kept on-line.

data quality/comments: a new system which primarily manages daily 1300 hour fire weather for National Fire Danger Rating System. RAWS data coordination with BLM Boise operations is ongoing. RAWS are often fire season only, and there is a need for year-round sensors for precipitation. Many automatic weather station (AWS) sites are replacing manual stations rather than being remote, but AWS does provide wildland weather information. Data management is evolving with WRCC for archived weather information. Other resource weather data needs and applications can be added to the system. RAWS maintenance and training programs are continuing to help ensure quality data.

cost/time: charges for Kansas City computer time to each user; real-time data interaction

5. ***Agrimet & Hydromet***

Bureau of Reclamation in Boise, ID, maintains a Northwest Cooperative Agricultural Weather Network, as a part of the Pacific Northwest Hydrometeorological Network for river and reservoir management. Refer to CHROMS below for more comprehensive discussion of hydrometeorological data. The AgriMet network is dedicated to improved irrigation water management through crop water use modeling with 42 weather stations in Washington, Oregon, Idaho, and Montana. Like the Hydromet, transmissions from each AgriMet station deliver data at 4 hour intervals via the GOES satellite to the Reclamation's computer in Boise. Data from 11 agricultural weather stations operated by Washington State University is also available through AgriMet.

source: Monte McVay (208) 378-5282
Bureau of Reclamation
1150 N. Curtis Rd.
Boise, ID 83706

data storage: computer tapes, on-line archives; historical data at WRCC

data types: all weather parameters and soil moisture and soil temperature; parameters recorded every 15 minutes or every hour; daily historical records such as maximums, minimums, means, and accumulated values; crop water use and evapotranspiration calculations on daily basis

use: all weather information applications

period of records: 1983 to present

data quality/comments: good data management and site maintenance. Contact Monte McVay for details.

cost/time: no charge for username and password; interactive on pc with modem

6. **CHROMS**

The Columbia River Operational Hydromet System (CHROMS) is a dedicated real-time data collection, processing, and display system for reservoir watermanagement in the Pacific Northwest. CHROMS is a number of independent data collection systems all forwarding data to a central data bank in Portland, Oregon, for processing and access by other users. Hydromet data systems include Bureau of Reclamation, Geological Survey, Natural Resources and Conservation Service (SCS), Corps of Engineers, National Weather Service, Bonneville Power Service, Forest Service, and British Columbia Hydro and

Power Authority. The CHROMS Automated Front End (CAFE) provides over 1500 hydromet stations of data interactively via pc.

source: Roger Ross, Meteorologist 503-326-3762
CENPD-PE-WMgineers, Northern
Portland, OR 97208-2870

data storage: no storage available on CAFE; there are over 11 remote networks with over 7 agencies storing hydromet data

data types: generally hourly, 3 hourly, 6 hourly, and daily data; about one year of data on-line; every conceivable type of hydromet data

use: water resource management and all weather information applications

period of records: about one year of data on-line; see individual agency data networks for historical records

data quality/comments: responsibility of collecting agency; no external quality control flags

cost/time: no cost; interactive real-time data

7. ***ASCADS***

Bureau of Land Management's Remote Automatic Weather Station/Remote Environmental Monitoring System (RAWS/REMS) Automated Storage Conversion and Distribution System (ASCADS) is located in Boise, ID, at the National Interagency Fire Center. A Direct Read Only Terminal (DROT) in Boise receives RAWS/REMS data from a Domestic Satellite (DOMSAT) service which relays the data from the GOES satellite. The DROT relays the data to ASCADS. ASCADS provides automatic storage, conversion, and distribution of RAWS/REMS data in a real-time format. ASCADS interacts with Initial Attack Management System and the Forest Service's WIMS, as well as WRCC and NWS.

source: Phil Sielaff 208-387-5726
NIFC - RAWS
3833 S. Development Ave.
Boise, ID 83705-5354

data storage: holds as much data on-line as possible, about 60 days for each system; inputs to WIMS for 1 year storage and WRCC for archival
data types: fire RAWS with data set of 8 elements hourly; REMS with data sets of 21 elements recorded hourly, in some cases, every 15 minutes; weather observations, hydrology, soils, HAZMAT, air quality data

use: all weather information applications; originally fire weather focus

period of records: about 60 days

data quality/comments: "Watchdog" data quality monitoring and reporting

cost/time: no cost; interactive on pc

8. ***Private or localized sources of weather information***

National Weather Service weather radar network NEXRAD information vendors are four private companies: Kavouras, Inc., Minneapolis, MN; WSI Corp, Billerica, MA; Paramax Systems Corp., Ivyland, PA; and Zephyr Weather Information Service, Westborough, MA. Many weather data private vendors provide information via PCs for a fee including: WeatherBank, Inc., Salt Lake City, UT; Weather Network, Inc., Chico, CA; WSI Corp., Billerica, MA; CompuServe, Columbus, OH; and AccuWeather, State College, PA. Weather data maybe obtained on the Internet from many sources, one of the more popular being The Weather Underground, maintained by the University of Michigan.

Large environmental databases, including NCDC climate data sets, are available on CD-ROM technology from: the NCDC; EarthInfo, Inc. and Hydrosphere, Inc.; WeatherDisc Associates; and others. Ilana Stern of the National Center for Atmospheric Research, in Boulder, CO, provides a summary of available weather information from many private sources. Some major private distributors of weather data include: Accu-Weather; Cyclogenesis; WeatherBank; Weather Network; WSI; and CompuServe. There are many consulting meteorologists who are certified through the American Meteorological Society, Boston, MA.

There are many other sources of weather information. One example is the Campbell Scientific stations run for avalanche condition monitoring with weather stations on the Gallatin National Forest at Big Sky and Bridger Bowl ski areas, and one on the Flathead National Forest at Big Mountain ski area. Glacier National Park operates weather stations as part of global climate change research. Montana's Highway Department operates a network of weather and highway conditions automatic weather stations.

9. ***Meteorological Master Directory***

NASA provides a multidisciplinary database of information service, called Global Change Master Directory, available at no cost on-line, accessible with a pc and modem. NASA Goddard Space Flight Center, Geenbelt, MD 20771, provides assistance and information on this meteorological information service, phone 301-441-4202 or FAX 301-441-9486.

10. ***State Climatologists***

NOAA, National Weather Service funding of state climatology programs ceased years ago, but many states have typically supported climatologists at a university. Montana's Jon Wraith, at Montana State University, Bozeman, 406-994-1997, tried to provide climatological services for a time after Joe Caprio retired, but Montana is currently without a climatologist. Idaho's Myron Molnau, at University of Idaho, Moscow, 208-885-6182, provides their climatological services, a linkage with the NWS cooperative weather observing program and Regional and National climate centers. All western states except Montana and New Mexico have a state climatologist.

11. ***Internet***

Almost all weather information agencies and companies are available on the Internet. Observations, forecasts, radar maps, satellite images, weather maps, statistics, ... virtually everything about weather and climate is now available over the World Wide Web by pointing and clicking your computer mouse. Many of the weather and climate products are provided by private companies using government systems of weather and climate data collection. As an example of the Internet World Wide Web home pages for weather and climate, one might try http://wrcc.sage.dri.edu/ for the Western Regional Climate Center, which provides linkage to numerous weather and climate data systems. Refer to UCAN below for discussion of the rapidly evolving Internet linking all agencies weather and climate data systems.

12. ***Unified Climate Access Network***

Federal and state agencies have joined together to unify access and availability of climate data and information for natural resource management. Unified Climate Access Network (UCAN) will provide users with virtual access via the Internet to climate datasets collected by federal, state, and county networks. UCAN will also provide a variety of climate applications such as statistical averages, frequency analyses, spatial mapping and risk analyses. Precipitation, temperature, wind, snow, solar radiation, and evaporation data by quarter hour, hourly, daily, monthly, and annually will be available over the Internet. Many climate interpretations will be available over the Internet, including: GIS precipitation and temperature layers; temperature and precipitation summaries; daily, weekly, monthly, and annual normals; frost free days and

growing season lengths; wetland determination tables; evapotranspiration estimates; construction days; Palmer Drought Index; Standardized Precipitation Index; rainfall frequencies; and climate generation parameters. Regional climate networks available and connected through the Internet include: High Plains Regional Climate Center; SNOTEL (NRCS); RAWS (BLM, FS); AGRIMET (Bur Rec); State networks like ALERT; and others. UCAN will provide historical datasets and near real-time climate data.

APPENDIX 9

BASELINE CONDITIONS and SOURCES OF EXISTING INFORMATION

The purpose of this section is to summarize existing information sources regarding air quality and AQRVs on Region 1 National Forest lands.

State Air Regulatory Agencies (Idaho, Montana and North Dakota). The primary responsibility of the state air regulatory agencies is to protect public health and safety from air pollution impacts. Much of the state air regulatory responsibility derives from Federal laws (i.e., as the Clean Air Act) and subsequent regulations, usually developed by EPA. In addition, states may have developed additional legislation e.g., the Clean Air Act of Montana, and rules such as the Montana Air Quality Rules. Because the primary responsibility of the state air regulatory agencies is to protect public health, much of their monitoring is in cities where the largest concentrations of pollution and people occur.

EPA Emission Source Inventories. EPA has national and international emissions inventory databases which may be useful to the Forest Service. Among them are the National Emissions Data System (NEDS) containing data on point and area sources throughout the country, the US NAPAP (National Acid Precipitation Assessment Program) Natural Particulate Emissions Inventory, the Canadian NAPAP Natural Particulate Emissions Inventory, and the NAPAP Modelers' Emissions Inventory (Version 2).

University Research and Publications. The University of Montana, Montana State University, University of Idaho, Idaho State University and others have conducted independent research which may be useful to the Forest Service in identifying baseline conditions for air quality, AQRVs, and Resource Values Affected by Air Pollution.

National Atmospheric Deposition Program. The National Atmospheric Deposition Program (NADP) network consists of about 200 sites throughout the United States which continuously monitor precipitation chemistry. Some sites also monitor dry deposition. Region 1 installed a high elevation site (MT97) at Lost Trail Pass on the Bitterroot NF which became operational in October, 1990. This is the only high elevation site in Montana or Region 1. The 1990-1996 Lost Pass site data had an average pH of 5.39, and sulfate of 0.19 mg/L. These low levels of acid deposition are comparable to three low elevation sites which occur within 25 miles of National Forest lands in Region 1: MT05, Glacier National Park; MT07, Clancy (near Helena); WY08, Tower Falls (Yellowstone NP, Wyoming). Precipitation chemistry is fairly uniform at all three sites. Average annual NADP pH from 1990-1996 is 5.19 at Glacier, 5.2 at Clancy, and 5.48 at Yellowstone. Average annual (1990-1996) sulfate (SO4) varied from 0.39 mg/L at Yellowstone, 0.43 mg/L at Glacier, and 0.46 mg/L at

Clancy. These measured levels of pH and sulfate deposition are also relatively moderate. Greater deposition loadings could be occurring at higher elevations where the most sensitive lakes are located.

Visibility. Two visibility camera sites were installed in the Bob Marshall Wilderness in July, 1989. Visibility cameras were also installed near the Cabinet Mountains Wilderness in 1990, and next to the Selway Bitterroot Wilderness in 1992. The Selway Bitterroot visibility camera was moved from Hells Half Lookout to Sula Peak Lookout in 1994. Only the camera at the Sula Peak Lookout continues to operate. Baldy Mountain visibility camera on the Salmon National Forest is adjacent to the Frank Church River of No Return and Selway Bitterroot Wilderness areas, with its camera aimed into the nearby Anaconda Pintler Wilderness. Close out reports are being prepared for the Montana sites which have been discontinued. All visibility data is stored at Air Resource Specialists, Inc. and with the Scott Copeland, air quality analyst for the Forest Service in Fort Collins, Colorado.

In addition to camera only sites operated by the Forest Service there is the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. This is a three phased effort to monitor visibility trends in Class I areas. The three phases or kinds of data that are collected are optical, scene, and aerosol. Sula Peak IMPROVE module A was installed in 1994, and Baldy Mountain IMPROVE module A on the nearby Salmon National Forest was installed in 1993. Other nearby IMPROVE sites are located in Glacier and Yellowstone National Parks.

EPA Western Lake Survey. During September and early October of 1985, the Forest Service and EPA cooperated in a survey of 719 lakes in the western US for the purposes of acid deposition baseline characterization. Results are reported in *Western Lake Survey Phase I* (EPA, 1/87). In Region 1, lake samples were obtained from the following wildernesses: Absaroka-Beartooth, Anaconda-Pintler, Cabinet Mountains, Great Bear, Lee Metcalf, Mission Mountains, Rattlesnake, and Selway Bitterroot. Relative to other western Regions, Region 1 was about average in lake sensitivity to acid deposition. Generally, lakes within the Lewis Range (including the Great Bear, Mission Mountain, and Rattlesnake Mountains) had relatively high alkalinity (and acid buffering) due to the predominately sedimentary geology. The Bitterroot and Beartooth Ranges had a high percentage of highly sensitive lakes (very low alkalinity).

Phase 1 and Phase 2 Lake Monitoring. In 1991, 93 lakes in the Selway Bitterroot Wilderness and 32 lakes in the Cabinet Mountains Wilderness were monitored for Phase 1 parameters (pH, alkalinity, acid neutralizing capacity, conductivity, and watershed characteristics). The sampling criteria included lakes which had potential for low amounts of acid neutralizing capacity (high elevation cirque lakes in resistant parent material). Many lakes were measured which had acid neutralizing capacity's less than the most sensitive lakes reported in the Western Lake Survey (1985). In 1992, 44 lakes in the Selway Bitterroot Wilderness, 19 in the Cabinet Mountains Wilderness, 39 in the Anaconda Pintler Wilderness, and six near the Anaconda Pintler Wilderness were sampled for Phase 2 parameters (Phase 1 plus several

additional anions and cations). Excellent correspondence was found between parent material and lake water chemistry. Several acid deposition sensitive lake systems were identified and 10 lakes were tentatively identified for Phase 3 (long term benchmark) monitoring. Absaroka Beartooth Wilderness Phase 2 parameters has included 35 lakes in 1993, 19 lakes in 1994, and 15 lakes in 1995. The Absaroka Beartooth Wilderness has fairly homogeneous parent material so variation in lake chemistry is related more to elevation and the amount of soil development and vegetation in the lake watersheds. In 1995 21 lakes were monitored for Phase 1 parameters in the Mission Mountains Wilderness. None of the Mission Mountains Wilderness lakes are highly sensitive to acid deposition.

Phase 3 Lake Monitoring. Phase 3 lake monitoring is designed to measure long term trends in lake chemistry on biological conditions. Phase 3 monitoring is designed to measure long term trends in lake chemistry and biological conditions. Phase 3 monitoring includes all of the chemical parameters in phase 2 plus chlorophyll a (index of productivity) and phytoplankton. In 1994 Phase 3 monitoring was initiated in Upper and Lower Libby lakes and Engle lake in the Cabinet Mountains Wilderness. In 1995 the Phase 3 monitoring was extended to include 4 lakes in the Selway Bitterroot Wilderness: North Kootenai and Upper Grizzly lakes in the Bitterroot NF, South Colt lake in the Clearwater NF, and Shasta lake in the Nez Perce NF. In 1996 reduced funding constrained the Phase 3 monitoring to 1 times per year at Libby lakes, North Kootenai, Shasta but added Twin Island and Stepping Stone lakes in the Absaroka Beartooth Wilderness.

Lake Periphyton Monitoring. Periphyton (algae scraped off lake substrate rocks) were collected for Phase 2 lakes in cooperation with the Montana Water Quality Division in an assessment of lake and wetland diatom periphyton in Montana. Periphyton species and abundance were evaluated for potential use as bioassessment indicators (D. Charles, F. Acker, and N.A. Roberts, 1996. Diatom Periphyton in Montana Lakes and Wetlands: Ecology and Potential as Bioassessment Indicators. Environmental Research Division, Academy of Natural Sciences, Philadelphia, PA). The results show that all of the Region 1 Wilderness areas evaluated (Cabinet Mountains, Selway Bitterroot, Anaconda Pintler, and Absaroka Beartooth) have low concentrations of diatoms dominated by "clean" water species with no observable impairment. The assessment found that Cabinet Mountains, Selway Bitterroot, and Anaconda Pintler Wilderness periphyton are similar but that Absaroka Beartooth Wilderness periphyton were distinctly different, with lower concentrations and fewer species. The authors speculated that the differences are due to the high elevation of the Absaroka Beartooth Wilderness lakes (most lakes >10,000 feet in alpine environments). The Absaroka Beartooth Wilderness lakes have low pH and conductivity, few organic compounds, and substantial water flow and chemistry variability through the year. Other than the strong relationships between diatom type and water quality characteristics, there were no readily apparent patterns in the data (i.e. individual indicator taxa, diversity metrics) that looked promising for distinguishing lake impairment.

Lake Sediments. Lake sediments can provide a record of metal deposition which could be useful to determine if metals are or were being deposited from air pollution or lake watershed sources. The 1992 sediment core samples in the Anaconda Pintler Wilderness were of limited utility in determining lake metal sediment deposition since the sediment cores were not analyzed in chronological sections. Sediment core samples should be collected in the deepest part of a lake (finest textured sediments), dried, subsampled at 2 mm sections and analyzed using intensive digestion/extraction ICP chemical analysis techniques for major metal parameters. Sediment cores should be taken sufficiently deep (10-15 cm) to allow a comparison of background sediment chemistry (prior to 1860) chronologically to the present.

Lichens

Lichens as Bioindicators of Air Quality

Air quality can be monitored using lichens, a composite organism of a fungus and a green algae and/or a bluegreen bacterium. Using lichens to monitor air quality involves chemical analysis of lichen tissue for pollutants and a survey of lichens abundance and composition to detect presence/absence/changes in sensitive species. Lichens can absorb and accumulate pollutants in much larger amounts than in the tissue of higher plants and can serve as living pollution storage indicators. Lichens are particularly useful indicators of sulfur dioxide and metals pollution.

Lichen Surveys in Three Northern Region Wilderness Areas

The Selway Bitterroot Wilderness, Anaconda Pintler Wilderness, and Cabinet Mountains Wilderness have been surveyed for lichen community representation as an index of air quality conditions. Dr. Larry St. Clair of Brigham Young University monitored lichen composition, density, and metal concentrations in the above wilderness areas in 1992, and the Selway Bitterroot Wilderness again in 1993 and 1994. Lichens were collected from rocks, soil, and bark at reference sites representative of the wilderness area diversity of climate, landforms, hydrology, geology, soils, plants, and vegetation.

Selway Bitterroot Wilderness Lichens

St. Clair established 15 air quality biomonitoring sites in and near the Selway Bitterroot Wilderness from 1992 to 1994. A total of 210 lichen species were identified and collected. Three to 5 pollution sensitive species were analyzed for 20 potential pollutants at each of the 15 reference sites. Elements analyzed are within background levels, with nickel, copper, titanium, and zinc elevated in some samples which may reflect substrate enrichment. The Selway Bitterroot Wilderness lichen flora is healthy, diverse, and unimpacted by air pollutants. St. Clair recommends 2 to 3 more sites be established on north boundary and 2 more sites on southwestern boundary of the Selway Bitterroot Wilderness and to re-evaluate sensitive species every 5 to 8 years (about year 2000).

Anaconda Pintler Wilderness Lichens

St. Clair established 10 air quality biomonitoring sites across the Anaconda Pintler Wilderness and adjacent areas west of Anaconda Copper Smelter in 1992. A total of 143 lichen species were identified and collected in the Anaconda Pintler Wilderness with additional 18 species outside. Three to 5 pollution sensitive species were analyzed for 20 potential pollutants at each of the 10 reference sites. The Anaconda Pintler Wilderness lichen tissue elements analyzed are within background levels, with nickel, titanium, and zinc elevated in some samples which may reflect substrate enrichment. The Anaconda Pintler Wilderness lichen flora is healthy, diverse, and unimpacted by air pollutants. On four of the five reference sites east of the Anaconda Pintler Wilderness in proximity to the Anaconda Copper smelter influence zone, lichen species diversity is low, sensitive species are poorly developed, there are more rock substrate lichen species, and lichen tissue has elevated levels of arsenic, nickel, chromium, copper, and lead. During smelter operations significant damage was done to most sensitive lichens east of the Wilderness. St. Clair recommends more sites in this Wilderness and to re-evaluate sensitive species every five to eight years (about year 2000).

Cabinet Mountains Wilderness Lichens
St. Clair established three air quality biomonitoring sites across the Cabinet Mountains Wilderness in 1992. A total of 94 lichen species were identified and collected. One to three pollution sensitive species were analyzed for 20 potential pollutants at each of the 10 reference sites. Elements analyzed are within background levels, with titanium and zinc being elevated in some samples which may reflect substrate enrichment. Cabinet Mountains Wilderness lichen flora is healthy, diverse, and unimpacted by air pollutants. St. Clair recommends more sites be established in other parts of the wilderness area and to re-evaluate sensitive species every 5 to 8 years (about year 2000).

Soil Conservation Service (SCS) Snow pH Monitoring. During the winters of 1980-81, 1981-82, 1982-83, and 1983-84, the Soil Conservation Service measured pH of surface snow at several snow course sites in Montana. Generally, the pH measurements in the southwest section of Montana were less than 5.0 pH units while the rest of western Montana had snow pH commonly greater than 5.0 pH units. The yearly variation in the shape of the pH zones may be associated with storm patterns. The SCS reports speculate that the low pH snow is being brought in from southwest of Montana and not directly related to pollution sources in Montana. During 1992, 58 sites were selected for pH monitoring using the same methodology as 1980-1984. However increased amounts of acid dye in the pH paper did not allow accurate readings in the low ionic strength melted snow solutions so the monitoring was discontinued.

USGS Snow Monitoring. In 1993, the USGS Water Resources Division, Colorado Division, under the direction of John Turk and George Ingersoll, initiated snowpack chemistry monitoring at 11 sites in Western Montana including: Big Mountain, Apgar and Noisy Basin (Glacier NP), Granite Pass and Showdown Ski Area (near Missoula), Chief Joseph Pass, Red Mountain (near Butte), Kings Hill, Big Sky, Targee Pass (near

West Yellowstone) and Daisy Pass (near Cooke City). Three sites in Yellowstone National Park are in the monitoring network: Canyon, Lewis Lake, and Sylvan Lake.

The 1993/1996 sites have low concentrations of metals and "clean" isotope rations of sulfate except for Kings Hill and Targee Pass which are slightly elevated. In 1997, Region 1 cooperated with the USGS in measuring six additional sites.

Particulate Matter Monitoring. In August, 1994, the Bitterroot National Forest, in conjunction with Regional and interagency support, began monitoring particulate matter less than 10 microns in diameter, PM-10, at Stevensville and West Fork Ranger Stations. High volume samplers and a continuously monitoring TEOM sampler provide managers with information on background ambient air quality concentrations as well as assessment of Forest Service management effects on air quality. PM-10 concentrations are compared with visibility photographs taken at Sula Peak IMPROVE and Stevensville. Sula Peak IMPROVE PM-2.5 data is incorporated into the annual monitoring reports. Annual PM-10 monitoring reports in 1995 and 1996, show nearby and long distance upwind wildfires measured 24 hour concentrations up to 81 micrograms per cubic meter of air, which is about half of current human health standards of 150 micrograms per cubic meter. Visibility is reduced and public complaints about smoke from either wildfire or prescribed fire occur when PM-10 concentrations are 30 micrograms per cubic meter and higher. Background ambient PM-10 concentrations at the West Fork, which is remote from community air quality effects, are often less than 5 micrograms per cubic meter. PM-10 is analyzed by Montana Department of Environmental Quality, who put the data into the EPA AIRS database.

APPENDIX 10

ANNUAL COST TO IMPLEMENT ARM MONITORING

APPENDIX 10 ANNUAL COST PER FOREST TO IMPLEMENT ARM MONITORING

Forest	FY97	FY98	FY99	FY2000	FY2001	FY2002
Bitterroot	$19,000-Lost Trail Pass NADP Site	$19,000-Lost Trail Pass NADP Site	$19,000-Lost Trail Pass NADP Site	$19,000-Lost Trail Pass NADP Site	$19,000-Lost Trail Pass NADP Site	$19,000-Lost Trail Pass NADP Site
	$6,000 MAGIC/Wand calib of N. Kootenai lk	$1,500-Phase 3 mtg of N. Kootenai lk	$1,500-Phase 3 mtg of N. Kootenai lk	$1,500-Phase 3 mtg of N. Kootenai lk	$1,500-Phase 3 mtg of N. Kootenai lk	$1,500-Phase3 mtg of N. Kootenai lk
	$22,000 Sula IMPROVE	$22,000 Sula IMPROVE	$22,000 Sula IMPROVE	$22,000 Sula IMPROVE	$22,000 SULA IMPROVE	$22,000 Sula IMPROVE
				$2,000 Lichens SBW $1,500 Lichens APW		
Kootenai	$1,500-Phase 3 mtg Libby lks	$1,500-Phase 3 mtg Libby lks	$1,500-Phase 3 mtg Libby lks	$1,500-Phase 3 mtg Libby lks	$1,500-Phase 3 mtg Libby lks	$1,500-Phase 3 mtg Libby lks
	$2,000 Cabinet Mountains Wilderness visib camera	$2,000 Cabinet Mountains Wilderness visib camera	$2,000 Cabinet Mountains Wilderness visib camera	$2,000 Cabinet Mountains Wilderness visib camera	$2,000 Cabinet Mountains Wilderness visib camera	$2,000 Cabinet Mountains Wilderness visib camera
			$2,000 Lichens CMW			
Flathead	$2,000 Lichens MMW					$2,000 Lichens MMW

Nez Perce	$6,000 MAGIC/Wand calib of Shasta Lake	$2,000-Phase 3 mtg of Shasta Lake	$3,000-Phase 3 mtg of Shasta Lake	$3,000-Phase 3 mtg of Shasta Lake	$3,000-Phase 3 mtg of Shasta Lake	$3,000-Phase 3 mtg of Shasta Lake
				$2,000 Lichen SBW		
Helena						
			$2,000 Lichens GMW		$1,500 Lichens SGW	
Deerlodge			$1,500 Lichens APW			$1,500 Lichens APW
Beaverhead			$1,500 Lichens APW			
Gallatin	$1,000 Phase 3 mtg of Twin Island & Step Stone Lakes	$6,000 MAGIC/Wand calib of Twin Island Lake	$1,000 Phase 3 mtg of Twin Island & Step Stone Lakes	$1,000 Phase 3 mtg of Twin Island & Step Stone Lakes	$1,000 Phase 3 mtg of Twin Island & Step Stone Lakes	$1,000 Phase 3 mtg of Twin Island & Step Stone Lakes

APW = Anaconda Pintler Wilderness
BMW = Bob Marshall Wilderness
CMW = Cabinet Mountains Wilderness
GMW = Gates of the Mountains Wilderness
MMW = Mission Mountains Wilderness
SBW = Selway Bitterroot Wilderness
HCW = Hell's Canyon Wildernes
ABW = Busywork Brattish Wilderness

APPENDIX 11

*GLOSSARY**

Acid Deposition: A complex chemical and atmospheric phenomenon that occurs when emissions of sulfur and nitrogen compounds and other substances are transformed by chemical processes in the atmosphere, often far from the original sources, and then deposited on earth in either a wet or dry form. The wet forms, popularly called "acid rain", can fall as rain, snow, or fog. The dry forms are acidic gases or particulates.

Airborne Particulates: Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Airborne particulates include: windblown dust, emissions from industrial processes, smoke from the burning of wood and coal, and the exhaust of motor vehicles.

Airshed Coordinator: These are individuals specified as smoke management coordinators for the operation of the Montana and Idaho State Airshed Groups. These individuals may or may not be Forest Service personnel. They have *not* traditionally been the same person as the Forest Air Contacts nor do they have the same duties.

Air Pollutant: Any substance in air which could, if in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of matter capable of being airborne. They may be in the form of solid particles, liquid droplets, gases, or in combinations of these forms. Generally, they fall into two main groups: (1) those emitted directly from identifiable sources and (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photoactivation. Exclusive of pollen, fog, and dust, which are of natural origin, about 100 contaminants have been identified and fall into the following categories: solids, sulfur compounds, volatile organic chemicals, nitrogen compounds, oxygen compounds, halogen compounds, radioactive compounds, and odors.

Air Quality Standards: The level of pollutants prescribed by regulations that may not be exceeded during a specified time in a defined area.

Ambient Air: Any unconfined portion of the atmosphere: open air, surrounding air.

Area Source: Any small source of non-natural air pollution that is released over a relatively small area but which cannot be classified as a point source. Such sources may include vehicles and other small combustion engines.

Attainment Area: An area considered to have air quality as good as or better than the national ambient air quality standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others.

AQRVs: (Air Quality Related Values) - A scenic, cultural, physical, biological, ecological, or recreational resource which may be affected by a change in air quality as defined by the land manager for federal lands or as defined by State or Indian governing body for non federal lands within their jurisdiction. AQRV's include those features or properties of a Class I Wilderness that made the area worthy of designation as a wilderness and that would or could be adversely affected by air pollution. AQRVs generally relate to visibility, odor, flora, fauna, soil, water, climate, geological features, and cultural resources. AQRVs will be specific, however, for each wilderness. AQRVs are considered in the context of Class I protection under the Clean Air Act.

Background Level: In air pollution control, the concentration of air pollutants in a definite area during a fixed period of time prior to the starting up or on the stoppage of a source of emission under control. In toxic substances monitoring, the average presence in the environment, originally referring to naturally occurring phenomena.

Best Available Control Measures (BACM): Control measures to be developed by EPA which apply to residential wood combustion, fugitive dust, and prescribed and silvicultural burning in "serious" PM-10 non-attainment areas. BACM is more stringent than RACM. Final guidance on BACM is still being developed.

Best Available Control Technology (BACT): An emission limitation based on the maximum degree of emission reduction which (considering energy, environmental, and economic impacts, and other costs) is achievable through application of production processes and available methods, systems, and techniques. In no event does BACT permit emissions in excess of those allowed under any applicable Clean Air Act provisions. Use of the BACT concept is allowable on a case by case basis for major new or modified emissions sources in attainment areas and applies to each regulated pollutant

Criteria Pollutants: The 1970 amendments to the Clean Air Act required EPA to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. EPA has identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen oxide. The term "criteria pollutants" derives from the requirement that EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on the basis of these criteria that standards are set or revised.

DFC: (Desired Future Condition) - DFC's describe what the future AQRV's will look like if protected so as not to incur a loss of wilderness character. Identification of DFC's is a management decision based upon how much change is acceptable before loss of wilderness character occurs.

Emission: Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys, and from motor vehicle, locomotive, or aircraft exhausts.

Emission Factor: The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Exceedance: Violation of environmental protection standards by exceeding allowable limits or concentration levels.

Forest Air Contact: An individual designated at the Forest to coordinate and be a contact for the air resource management program. This individual has *not* traditionally been the same person as the airshed coordinator designated by the Montana and Idaho State Airshed Groups nor do they have the same duties.

Greenhouse Effect: The warming of the Earth's atmosphere caused by a build-up of carbon dioxide or other trace gases; it is believed by many scientists that this build up allows light from the sun's rays to heat the Earth but prevents a counterbalancing loss of heat.

Hazardous Air Pollutants: Air pollutants which are not covered by ambient air quality standards but which, as defined in the Clean Air Act, may reasonably be expected to cause or contribute irreversible illness or death. Such pollutants include asbestos, beryllium, mercury, benzene, coke oven emissions, radionuclides, and vinyl chloride.

MAGIC/WAND Model: Model of Acidification of Groundwater in Catchments/with Aggregated Nitrogen Dynamics. The model consists of soil solution equilibrium equations in which the chemical composition of soil solution is assumed to be governed by simultaneous reactions involving sulfate adsorption, cation exchange, dissolution and precipitation of aluminum, dissolution of organic carbon, and nitrogen fluxes. The model then uses mass balance equations accounting for fluxes of major ions to and from the soil, governed by atmospheric inputs, mineral weathering, net uptake in biomass, and loss in runoff to simulate surface and water chemistry.

Major Modification: This term is used to define modifications with respect to Prevention of Significant Deterioration and New Source Review under the Clean Air Act and refers to modifications to major stationary sources of emissions and provides significant pollutant increase levels below which a modifications not considered major

Major Source: Any source belonging to a list of 28 specified categories that have the potential to emit 100 tons per year or more of any pollutant regulated under the Clean Air Act (CAA) or a source not listed on the 28 categories but has the potential to emit 250 tons per year or more of any pollutant regulated under the CAA. A major source must apply for and obtain a Prevention of Significant Deterioration permit prior to construction or modification.

Major Stationary Sources: Term used to determine the applicability of Prevention of Significant Deterioration and new source regulations. In a non-attainment area, any

stationary pollutant source that has a potential to emit more than 100 tons per year is considered a major stationary source. In Prevention of Significant Deterioration areas, the cutoff level may be either 100 or 250 tons, depending upon the type of source.

National Ambient Air Quality Standards (NAAQS): Air quality standards established by EPA that apply to outside air throughout the country. (See criteria pollutants, state implementation plans, emissions trading)

NADP: National Atmospheric Deposition Program. A program initiated in 1978 to address the problem of atmospheric deposition and its effects on agriculture, forest, rangelands and fresh water streams and lakes.

New Source: Any stationary source which is built or modified after publication of final or proposed regulations that prescribe a standard of performance which is intended to apply to that type of emission source.

New Source Performance Standards (NSPS): Uniform national EPA air emission and water effluent standards which limit the amount of pollution allowed from new sources or from existing sources that have been modified.

Non-Attainment Area: Geographic area which does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

Non-Point Source: Pollution sources which are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet.

Opacity: The amount of light obscured by particulate pollution in the air clear window glass has zero opacity, a brick wall 100 percent opacity. Opacity is used as an indicator of changes in performance of particulate matter pollution control system.

Particulates: Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.

Plume: 1. A visible or measurable discharge of a contaminant from a given point of origin, can be visible or thermal in water, or visible in the air as, for example, a plume of smoke. 2. The area of measurable and potentially harmful radiation leaking from a damaged reactor. 3. The distance from a toxic release considered dangerous for those exposed to the leaking fumes.

Point Source: A stationery location or fixed facility from which pollutants are discharged or emitted. Also, any single identifiable source of pollution, e.g., a pipe, ditch, ship, ore pit, factory smokestack.

Potential to Emit: The maximum capacity of a stationary source to emit a pollutant under its physical and operational design. See Forest Service Handbook 2509.19 for more detailed definition.

Prevention of Significant Deterioration (PSD): A program in which state and/or federal permits are required that are intended to restrict emissions for new or modified sources in places where air quality is already better than required to meet primary and secondary ambient air quality standards.

Reasonably Available Control Measures (RACM): Control measures developed by EPA which apply to residential wood combustion, fugitive dust, and prescribed and silvicultural burning in and around "moderate" PM-10 non-attainment areas. RACM is designed to bring an area back into attainment and uses a smoke management program which relies on weather forecasts for burn/no burn days.

Reasonably Available Control Technology (RACT): The lowest emissions limit that a particular source is capable of meeting by the application of control technology that is both reasonably available, as well as technologically and economically feasible. RACT is usually applied to existing sources in non-attainment areas and in most cases is less stringent than new source performance standards.

RVAAP: (Resource Values Affected by Air Pollution) - Features or properties of non-Class I National Forest Land which are or could be changed by air pollution. The RVAAPs are usually the same parameters as AQRVs but occur on Class II Wilderness Areas (designated after 8/7/77). The primary legal mandates for protecting RVAAPs are the Wilderness Act in Class II Wildernesses and NF non-wilderness lands.

Sensitive Receptor: Specific components of an AQRV or RVAAP which may first exhibit man-caused change from air pollution. For example, a sensitive (i.e., poorly buffered) lake may be a sensitive receptor for aquatic ecosystems or a specific watershed. Lichens may be a sensitive receptor for the flora or vegetation AQRV because lichens can accumulate air pollutants. Zooplankton may be a sensitive receptor for the fauna AQRV because zooplankton's immediate environment is affected by precipitation chemistry.

Standard Visual Range (SVR): The visual range at which a black object can just be seen against the horizon. SVR is commonly used as an indicator of visibility.

State Implementation Plans (SIP): EPA-approved state plans for the establishment, regulation, and enforcement of air pollution standards.

Stationary Source: A fixed, non-moving producer of pollution, mainly powerplants and other facilities using industrial combustion processes.